A Lunar Chaos Theory

Dr. Hans Hannula, PhD, RSA, CTA

Approach to A New Theory

For many years, the author has been on the trail of the physical causes of cycles in stocks and commodities [5][6]. This research has lead to many interesting discoveries, but none more interesting or potentially more profitable than a new theory of chaotic behavior in the moon's orbit. Before proceeding with the discussion of this discovery, a word about my methodology is in order.

In my work, which I call Market AstroPhysics, I follow a scientific approach with these steps:

1. Develop a physical theory for a particular cause and effect phenomenon

2. Develop a mathematical model to describe the phenomenon

3. Compute the time series for the model

4. Statistically correlate the time series with market action

5. If the statistics show a correlation that is far better than chance, test the relationship in real time to see if the predicted market action occurs

6. If real-time and statistical tests justify it, use the predictions as an aid in trading the markets

This approach has enabled me to sort out many new things about cycles and how they operate. Now let us look at one such phenomenon.

Basic Physical Mechanisms

Development of a physical theory of cycles begins with an examination of how the solar system is constructed. It is composed of ten very important chucks of rock orbiting about a ball of burning gas, our sun. The nine planets and our moon are the big rocks. For eons, these rocks have proceeded relentlessly on their courses, carefully balancing the forces they exert on each other and on the sun, and visa versa. To date, there have been two mechanisms proposed that could explain the effects of this system on earthly events.

Dr. Theodore Landscheidt [9][10][11] has presented many correlations between the center of mass of the solar system and the outburst of solar flares. His theory is that as the planets rotate, they shift the center of mass of the combined planet/sun system around. At times this center of mass moves outside the surface of the sun. As it passes the sun's surface, a chaotic boundary condition exists, resulting in outbursts of large solar flares. This phenomenon is described by the equation:

$$\sum_i m_i r_i = 0$$

where

m = mass of the planets or sun
r = distance to the center of mass
i = index running from 1 to 10 for 9 planets plus the sun

This equation computes the point at which the mass of the planets and sun is effectively concentrated. The outer planets, because of their large distances from the sun, dominate these equations. Jupiter, because of its enormous size, is very influential.

The author has described another mechanism[5] initially pro-

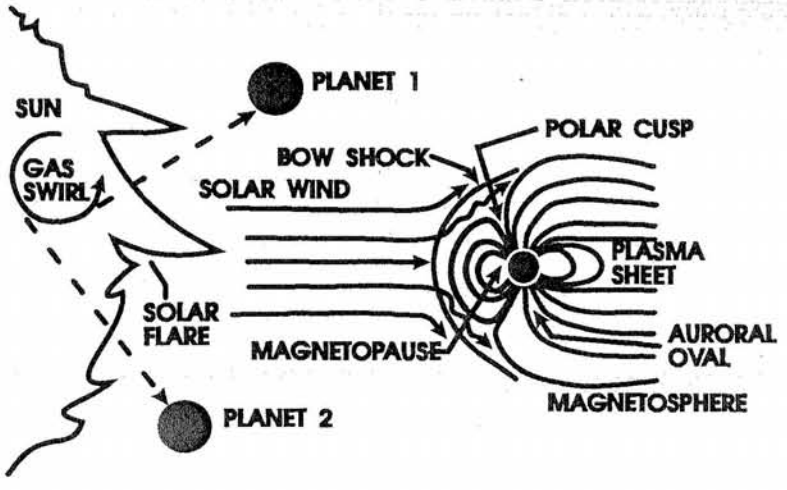


Figure 1. SOLAR STIRRING FORCE

posed by climate researchers in the early 1900s [2][12]. Figure 1

$$f = k \sum_{i} \frac{m_i}{r_i^3}$$

where

k = a constant to make gas swirl mass = 1
m = mass of the planet
r = distance from sun to planet
i = index from 1 to 9 for all planets

shows this mechanism.

As the planets orbit the sun, they exert tidal forces upon the gases of the sun, much as the moon raises tides on the earth. The equation below describes these forces.

Numerical solution of this equation reveals that Jupiter, Mercury, Venus, Earth, Mars, and Saturn are the most influential, in that order.

In Figure 1 shows this tidal effect caused by planets 1 and 2 rotating a gaseous portion of the sun's surface. These gas swirls cause several solar effects, including sun spots, coronal holes, and solar flares. All these effects combine to vary the amount of radiation that leaves the sun.

This solar radiation travels toward the earth in two ways, as direct radiation, such as sunshine and radio waves, and as particles, carried by the solar wind. This flow of charged particles forms a torrent of energy that blast spaceship earth, creating a bow wave and a wake just as a boat going upstream would do. This bow shock wave forms a magnetopause between the earth and the sun. It interacts with the earth's magnetic field, shaping and adding energy to it. At the north and south poles, the charged particles follow the magnetic lines of force, and enter our atmosphere in a Polar Cap Absorption Event [8]. This leads to the auroral oval, producing our Northern and Southern Lights.

The bow wave also creates an envelope about the earth, called the magnetosphere. As the solar wind flows past the earth, the magnetosphere forms a teardrop shaped envelope of trapped particles, ending in the magnetotail. It is inside this envelope that the moon orbits.

As the solar radiation varies, so does the earth's magnetic field, atmospheric Ionization, and temperature. Scientists have tracked down a host of relationships between these events and a variety of earthly phenomena such as climate, weather, crime rates, plant growth rates, frequency of thunderstorms, blood PH levels, psyciatric emergencies, etc. [8][15][1] My own work has related these events to market action as well [5][6].

I believe there is also a third mechanism at work, one involving the moon. Let me explain.

A Theory of Lunar Chaos

The moon's orbit is the most complex of all the ten bodies under consideration[3]. While a planet's position may be accurately computed from an equation containing about nine or so terms, computing the moon's location to the same accuracy requires over 100 terms. Some of these terms are directly traceable to the pull of various planets and the sun on the moon. For example, there is a term related to Venus, our closest planetary neighbor[14]. All these terms still do not describe a stable orbit, but one that rotates slowly in space, coming back to the same orientation in about 18.6 years. This is the moon's nodal cycle. Most people are familiar with the moon's full moon, new moon, or synodic cycle of 29.531 days[19]. Many have tried to correlate it with market movements [16][13][18].

The moon has many other cycles. It moves closer to and further from the earth, in what is the moon's anomalistic cycle, which is 27.554 days long. As the moon passes through the ecliptic plane (the plane of the earth's orbit) it crosses at its node, to form the moon's draconic cycle of 27.212 days (so named by the ancient Chinese, who viewed this cycle as having the power of a dragon). Further, as the moon passes the earth's equator, it forms the lu-

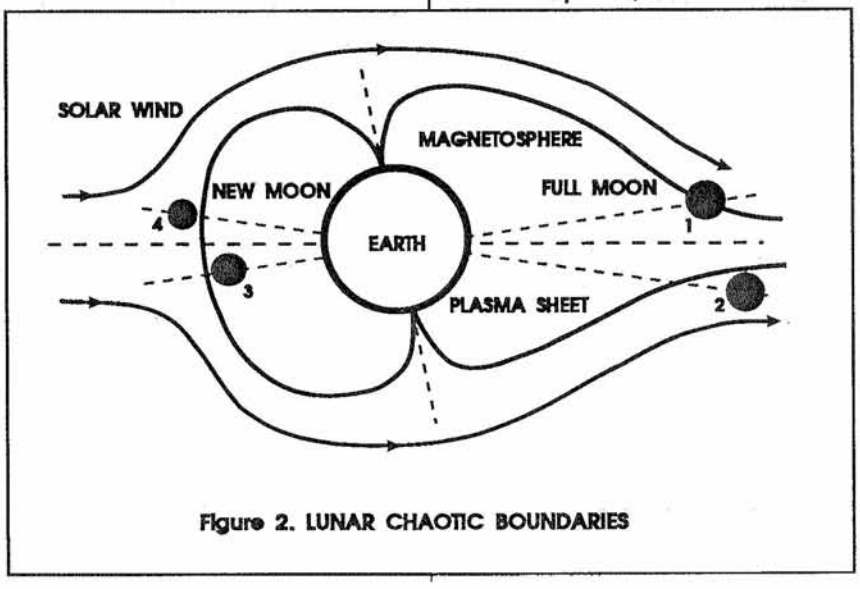


Figure 2. LUNAR CHAOTIC BOUNDARIES

nar tropical cycle of 27.321 days. There is also the motion from star to star, which is the sidereal cycle, of 27.322 days. Additionally, since the moon's orbit tips approximately 5 degrees, the observer on earth sees the moon "ride high" or "ride low" as it revolves in its orbit. The venerable Farmer's Almanac [20] points out the effect of this on tides, weather, and earthquakes.

I have, I believe, discovered another lunar cycle that I call **the lunar chaos cycle.** Figure 2 shows this cycle pictorially.

My theory is that as the moon rides high and low, and moves closer and further from the earth, that the moon crosses the boundary between the ionized particles trapped in the moon's wake and the fast flowing solar wind. Figure 2 shows this possibly happening at two full moon positions (1 and 2) and two new moon positions (3 and 4). Such boundary crossings would lead to sharp disturbances in the earth's magnetic field, affecting those of us who live within it.

A further perturbation can be theorized as well. This is the perturbation of the nearby planets Mercury and Venus. When the moon balances on the edge of the magnetopause, a chaotic balance point exits [7]. Either interior planet can tug the moon into the solar wind, tipping the balance just as Lorenz's Butterfly Effect tips the balance in weather [4].

a(t) = 10 for |I| > 5 degrees

a(t) = 10 |I| for |I| > 3 and <5 degress

b(t) = 10 ((30 - |a|)/30) for |a| < 30

b(t) = 0 for |a| > 30 degrees

f(t) = a(t) b(t)

where

a(t) is a lunar inclination function

b(t) is a planetary alignment function

f(t) is a lunar chaos function

|I| is the absolute value of moon's inclination, I

|a| is the absolute value of the planet to moon geocentric angle

A Simple Mathematical Model

To test this theory, I created a simple mathematical model. This model computes the degree of exact alignment of a planet (either Mercury or Venus) with the Earth and moon, and when the moon is above or below 3 degrees inclination. This yields a lunar chaos input function for each planet. The equations are given below.

For A possibly causual events, correlating with B possible resulting events, with K of the B events falling within window W about each A event, over time interval T, the probability of chance occurrence is:

$$P_{TOTAL} = \frac{B!}{K!\,(B-K)!} P^{K} (1-P)^{(B-K)}$$

where

P is the probability of one event falling into time window W and equals AW/T

and n! means (n)(n-1)(n-2)...(2)(1)

These equations give a maximum value when the planet and moon directly line up and the moon is at maximum height above or below the ecliptic. They have zero values inside the theorized envelope boundaries, giving us non-linear equations. It is well known that non-linear equations can lead to systems that exhibit chaotic behavior [4][7].

Statistical Testing

In testing any such theory, it is standard research practice to compare the observed correlations with what one would expect to see if the correlations were purely random. The probability of the correlation occurring by chance is computed from the formula below [17].

The first step in verifying the hypothesis of the lunar chaos theory is to examine the relationship with the earth's magnetic field. Figure 3 shows one year of a ten year study correlating the two lunar chaos functions with K_pSum. This is the daily sum of the K_p planetary geomagnetic field measurements. The Mercury chaos function correlates 30 times better than chance, and the Venus function correlates 62 times better than chance. Fully 92 per-

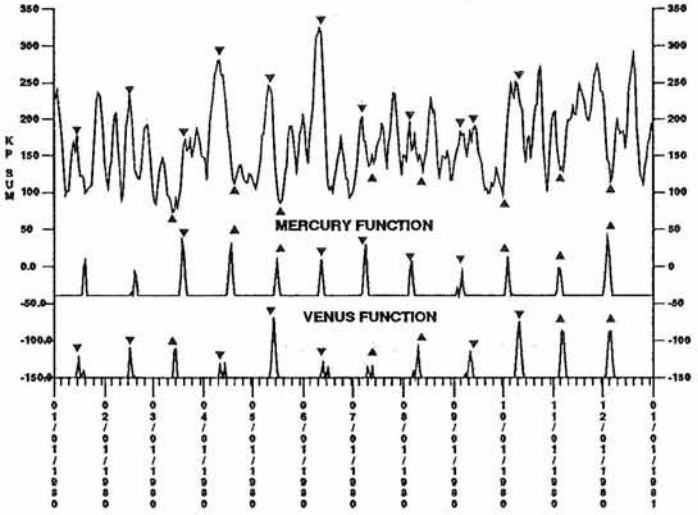


Figure 3. Kp SUM MAGNETIC INDEX AND THE LUNAR CHAOS FUNCTIONS

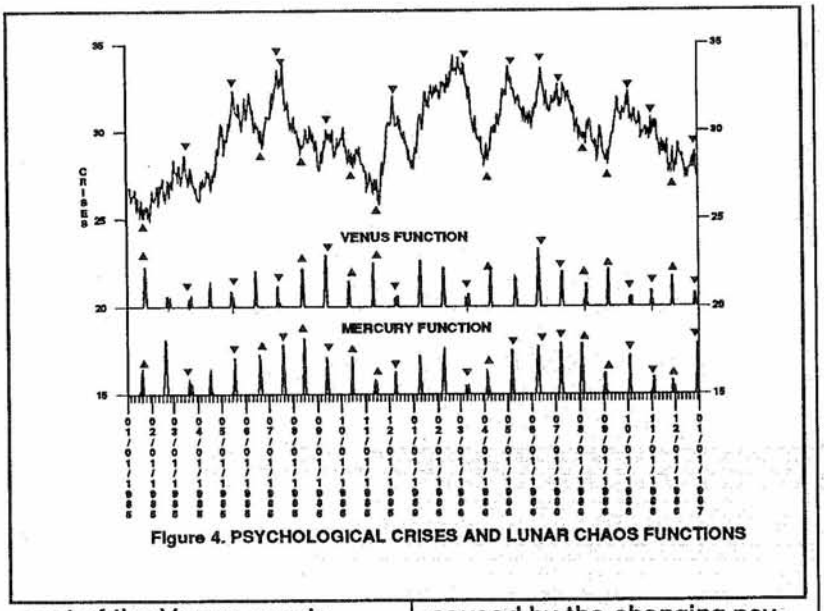


Figure 4. PSYCHOLOGICAL CRISES AND LUNAR CHAOS FUNCTIONS

cent of the Venus events mark sharp highs or lows in the electromagnetic field, while 83 per cent of the Mercury events do so.

The second step in testing the theory is to examine the relationship to human psychology. This is more difficult to do because of the absence of readily available data on psychological moods. However, I was able to obtain one data set that measures the number of psychological crises at a crises center over a two year period. The correlation of the chaos functions with this data is shown in Figure 4.

The Venus lunar chaos function correlated 36 times better than chance, while the Mercury function was 131 times better than chance. Fully 76 per cent of the Venus events coincided with highs and lows in the crises data, while 84 percent of the Mercury events did so.

Another step in the testing is to examine the relationship to market movements, which are commonly believed to be caused by the changing psychology of buyers and sellers.

One market that seems to validate this theory is gold. Shown in Figure 5 is one year of the ten year correlation study done between the lunar chaos functions and the price of gold. As you will note, the chaos functions tend to mark highs, lows, and volatile moves in gold. Particularly dramatic are those periods when both Mercury and Venus tug the moon as it passes into the solar wind.

To test the possible randomness of this correlation, I performed a 10 year statistical study. I counted the number

	NUMBER OF CHAOS EVENTS	NUMBER TURNS HITTING WINDOWS	PROBABILITY OF BEING RANDOM	ODDS AGAINST BEING RANDOM
VENUS	121	41	.00138	724:1
MERCURY	121	40	.00254	393:1
BOTH	88	31	.00350	285:1

NOTE: NUMBER OF TURNS IN GOLD = 85
WINDOW = 10 DAYS, INTERVAL = 3652 DAYS

Table 1. Gold Chaos Statistics

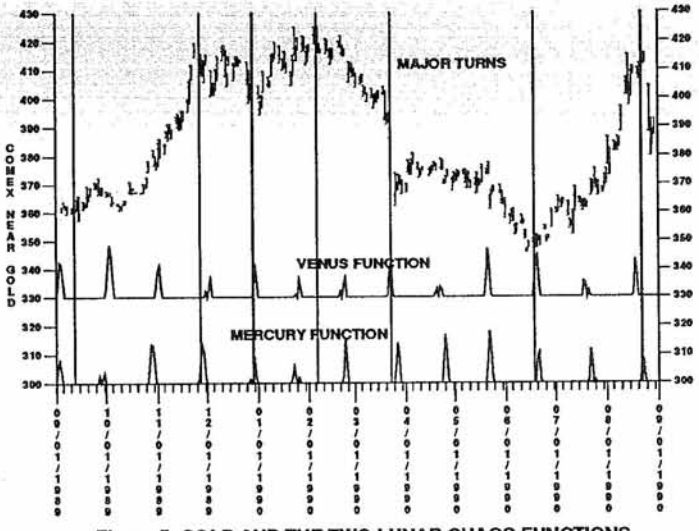


Figure 5. GOLD AND THE TWO LUNAR CHAOS FUNCTIONS

of lunar chaos events that coincided with mechanically selected highs and lows in gold. The mechanical selection process used was to take a 5 day moving average of gold near contract closes, and then to require at least a three percent countertrend move to indicate a significant high or low. This process yielded 85 significant highs and lows in the 3652 days of the test. A window of 10 days was used, since the average width of the chaos function "pulse" is about 6 days, and 2 days either side of this seemed a reasonable window. Table 1 gives the statistics of the study.

This study shows correlations for the Venus Chaos Function that are 724 times better than chance, for the Mercury Chaos Function 393 times better than chance, and for both simultaneously, 285 times better than chance. While this is not positive proof of the theory, these values are clearly statistically significant.

A Real Time Test

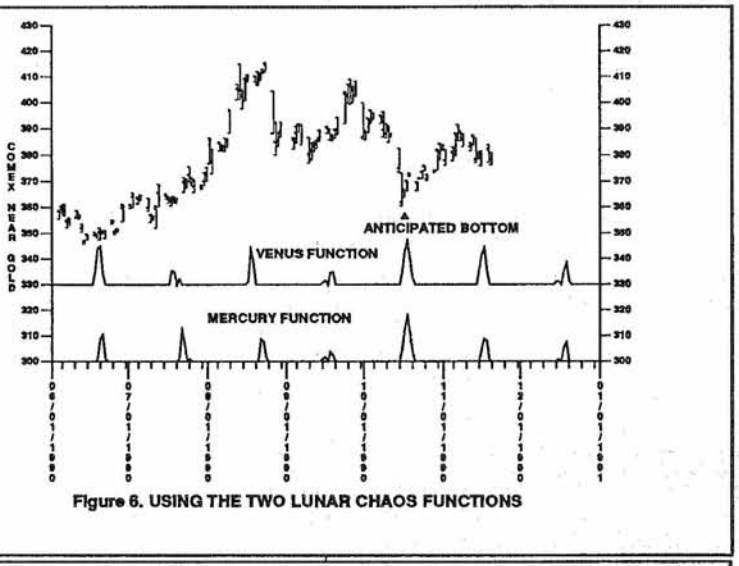


Figure 6. USING THE TWO LUNAR CHAOS FUNCTIONS

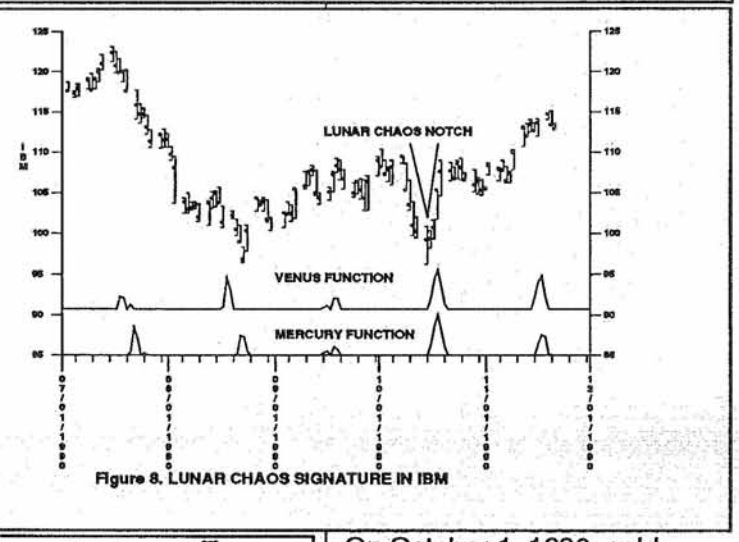


Figure 8. LUNAR CHAOS SIGNATURE IN IBM

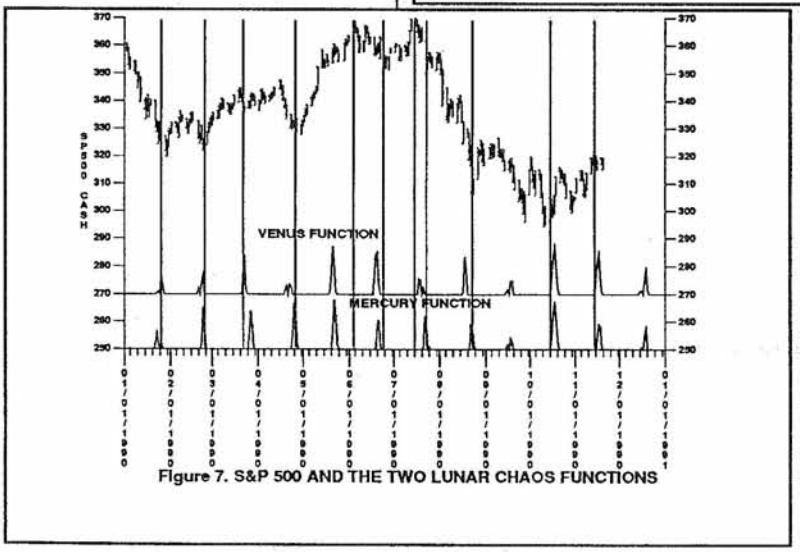


Figure 7. S&P 500 AND THE TWO LUNAR CHAOS FUNCTIONS

On October 1, 1990, gold gapped and closed lower. A few days later a correction had formed, and the question was, " When will the down trend end? ". Examination of the lunar chaos functions suggested a possible bottom in the period between October 15th and 21st, with the 17th as the most likely date. Further, gold could be expected to be volatile into this bottom. Figure 6 shows what happened. Gold bottomed on the 16th, after a plunge of over $60. The following rally recovered over 30 points.

Other Correlations

One can also expect such a powerful phenomena to be found in other markets. Figure 7 shows the S&P 500 index with the lunar chaos functions. Note how the functions again mark highs and lows. The probability of these correlations being random is less than one chance in 297.

Figure 8 shows the effect of this phenomenon on IBM stock. IBM was rallying steadily following the dramatic summer 1990 Iraq panic. Suddenly, IBM plunged nearly 13 points, and just as suddenly rebounded sharply. This was a new moon phenomenon, with the moon riding low, and Mercury and Venus both in line with the sun, moon, and Earth. I call this very noticeable "signature" a Lunar Chaos Notch.

Conclusions

While at first it may be hard for the average buyer or seller of stocks and commodities to accept that his fortunes are controlled by a burning ball of gas and ten pieces of revolving rock, this study presents scientific evidence that this indeed may be true. The theory of lunar chaos does provide a rational explanation of possible cause and effect. The statistics of correlation, while they do not "prove" the theory correct, are sufficiently strong to permit one to claim that this theory is possible.

Of course, as with any new theory, much needs to be done to improve it. Work is currently underway to procure the NASA lunar siesmographic and accelerometer data for further verification of the timing of lunar chaos and related geomagnetic disturbances. However, even in its current form, this theory and the two chaos functions can provide traders with a valuable timing tool.

Dr. Hans Hannula is a trader, engineer, and programmer with over 20 years experience. He publishes the Market Astro-Physics newsletter, (303) 452-5566.

References

[1] Blizzard, J. B. , Lunar Newsletter, Boulder, CO. 1986-1990.

[2] Clayton, H. H., Effects of Short Period Variations of Solar Radiation on the Earth's Atmosphere, Smithsonian Institution, May, 1917.

[3]Danby, J. M. A. , Fundamentals of Celestial Mechanics, Wilman-Bell, Richmond, Va. 1962.

[4]Gleick, J. Chaos, Making A New Science, Viking Press, New York, 1987.

[5]Hannula, H. "In Search of the Cause of Cycles", *Technical Analysis of Stocks and Commodities*, March, 1987. Reprinted in *Cycles*, Sept/Oct. 1987.

[6]Hannula, H. "In Search of the Cause of the Crash of 1987", *Cycles*, Dec. 1987.

[7]Hannula, H., "Making Money With Chaos", *Technical Analysis of Stocks and Commodities*, September, 1990.

[8] Herman, J. R. and Goldberg, R. A., Sun, Weather, and Climate, Dover Publications, New York, 1985.

[9] Landscheldt, T. "Multidisciplinary Forecast of Stock Prices", *Cycle Proceedings*, May 1988

[10]Landscheidt, T., "Creative Functions of Cycles", *Cycles*, May/June 1989.

[11]Landscheidt, T., "Predictable Cycles in Geomagnetic Activity and Ozone Levels", *Cycles*, Sept./Oct. 1989.

[12]Luby, W. A., " The Cause of Sunspots", *Popular Astonomy*, Feb. 1945.

[13]Matlock, C. C., Man and Cosmos, Development Cycles Research Project, Waynesville, N. C. 1977.

[14]Meeus, J., Astronomical Formulae for Calculators, Wilman-Bell, Richmond, Va., 1985.

[15]McCormac, B. M. ,editor, Weather and Climate Responses to Solar Variations, Colorado Associated Universtiy Press, 1983.

[16]Pugh, B. H. Science and Secrets of Wheat Trading, 6 volumes, 1928.

[17] Shirley, J. H., " When the Sun Goes Backward:", *Cycles*, May/June 1988.

[18]Thompson, L. M., " The 18.6 Year and 9.3 Year Lunar Cycles", *Cycles*, Dec. 1988.

[19] The Astronomical Almanac, U. S. Government Printing Office, 1990.

[20]The Old Farmer's Almanac, Yankee Publishing, Dublin, N.H., 1990.

A Lunar Chaos Theory

by Hans Hannula

For many years, the author has been on the trail of the physical causes of cycles in stocks and commodities. This research has lead to many interesting discoveries, but none more interesting or potentially more profitable than a new theory of chaotic behavior in the moon's orbit.

Approach to a New Theory

In my work, which I call Market AstroPhysics, I follow a scientific approach with these steps:

1. Develop a physical theory for a particular cause and effect phenomenon.
2. Develop a mathematical model to describe the phenomenon.
3. Compute the time series for the model.
4. Statistically correlate the time series with market action.
5. If the statistics indicate a correlation that is far better than chance, test the relationship in real time to see if the predicted market action occurs.
6. If real-time and statistical tests justify it, use the predictions as an aid in trading the markets.

This approach has enabled me to sort out many new things about cycles and how they operate. Let us look at one such phenomenon.

Hans Hannula holds a Ph.D. in electrical and computer engineering. He is a trader, engineer, and programmer with more than 20 years' experience. He publishes the Market AstroPhysics newsletter.

Basic Physical Mechanisms

Development of a physical theory of cycles begins with an examination of the solar system's construction. It is composed of ten very important chunks of rock that orbit a ball of burning gas, the sun. The nine planets and our moon are the big rocks. For eons, these rocks have proceeded relentlessly on their courses, carefully balancing the forces they exert on each other and on the sun, and vice versa.

To date, two mechanisms have been proposed that could explain the effects of this system on earthly events.

Theodore Landscheidt (1988, 1989a,b) has presented many correlations between the solar system's center of mass and the outburst of solar flares. His theory states that, as the planets rotate, they shift the center of mass of the combined planet/sun system around. At times, this center of mass actually moves outside the surface of the sun. As it passes the sun's surface, a chaotic boundary condition exists, resulting in outbursts of large solar flares. This phenomenon is described by the equation:

$$\sum_i m_i r_i = 0$$

where

m = mass of the planets or sun
r = distance to the center of mass
i = index running from 1 to 10 for 9 planets plus the sun

This equation computes the point at which the mass of the planets and sun is effectively concentrated. Because of their large distances from the sun, the outer planets dominate these equations. Jupiter, because of its enormous size, is very influential.

The author has described another mechanism (Hannula 1987) initially proposed by climate researchers in the early 1900s (Clayton 1917; Luby 1945). As the planets orbit the sun (see Figure 1), they exert tidal forces on the sun's gases, much as the moon raises tides on the earth. These forces are described by the equation:

$$f = k \sum_i \frac{m_i}{r_i^3}$$

where

k = a constant to make gas swirl mass = 1
m = mass of the planet
r = distance from sun to planet
i = index from 1 to 9 for all planets

Numerical solution of this equation reveals that Jupiter, Mercury, Venus, Earth, Mars, and Saturn are the most influential, in that order.

In Figure 1, this tidal effect is shown by the rotation of a gaseous portion of the sun's surface by planets 1 and 2. These gas swirls cause a number of solar effects, including sunspots, coronal holes, and solar flares. All these effects combine to vary the amount of radiation that leaves the sun.

This solar radiation is carried toward the earth in two ways: (1) as direct radiation, such as sunshine and radiowaves, and (2) as particles carried by the "solar wind." This flow of charged particles forms a torrent of

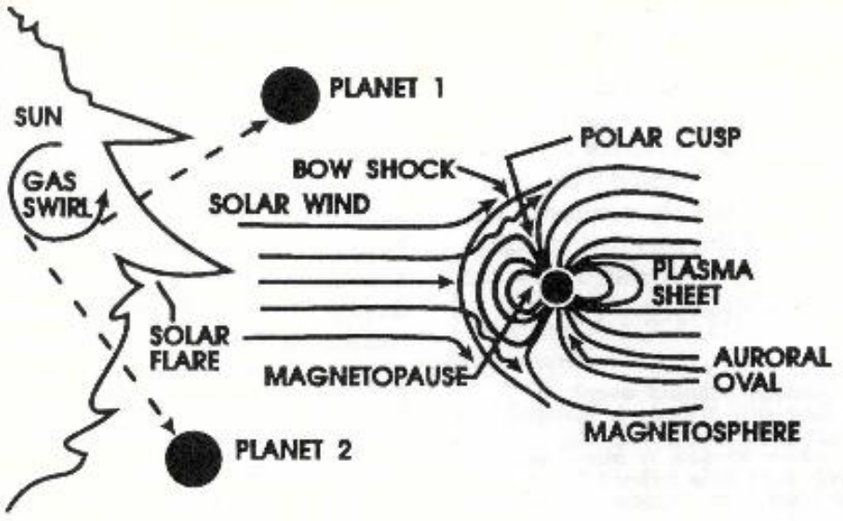


FIG. 1. Solar stirring force.

energy that blasts spaceship earth, creating a bow wave and a wake, just as a boat going upstream would do.

This bow wave forms a magnetopause between the earth and the sun, and interacts with the earth's magnetic field, both shaping it and adding energy to it. At the north and south poles, the charged particles follow the magnetic lines of force, and enter our atmosphere in what is called a Polar Cap Absorption Event (Herman and Goldberg 1985). This leads to the auroral oval, producing our Northern and Southern Lights.

The bow wave also creates an envelope about the earth, called the magnetosphere. As the solar wind flows past the earth, the magnetosphere forms a teardrop-shaped envelope of trapped particles that ends in what is called the magnetotail. It is inside this envelope that the moon orbits.

As the solar radiation varies, so does the earth's magnetic field, atmospheric ionization, and temperature. Scientists have tracked down a host of relationships between these events and a variety of earthly phenomena such as climate, weather, crime rates, plant growth rates, frequency of thunderstorms, blood PH levels, psychiatric emergencies, etc. (Herman and Goldberg 1985; McCormac 1983; Blizard 1986-90). My own work has related these events to market action as well (Hannula 1987a,b).

I believe a third mechanism that involves the moon also is at work.

A Theory of Lunar Chaos

The moon's orbit is the most complex of the ten bodies under consideration (Danby 1962). A planet's position may be accurately computed from an equation that contains nine or so terms, but computation of the moon's location to the same accuracy requires more than 100 terms. Some of these terms are directly traceable to the pull of various planets and the sun on the moon. One term, for example, is related to Venus, our closest planetary neighbor (Meeus 1985).

All these terms still do not describe a stable orbit, but one that rotates slowly in space, returning to the same orientation in about 18.6 years. This is called the moon's nodal cycle. Most people are familiar with the moon's full moon, new moon, or synodic cycle of 29.531 days (*Astronomical Almanac* 1990). Many have tried to correlate it with market movements (Pugh 1928; Matlock 1977; Thompson 1988).

The moon has many other cycles. It moves closer to and further from the earth in the "anomalistic cycle" of 27.554 days. As the moon passes through the ecliptic plane (the plane of the earth's orbit), it crosses at its node, to form the "draconic cycle" of 27.212 days (named by the ancient Chinese, who viewed this cycle as having the power of a dragon). As the moon passes the earth's equator, it forms the "lunar tropical cycle" of 27.321 days. The motion from star to star is the "sidereal cycle" of 27.322 days. Additionally, since the moon's orbit is tipped approximately 5°, the observer on earth sees the moon "ride high" or "ride low" as it revolves in its orbit. The venerable *Old Farmer's Almanac* (1990) points out the affect of this on tides, weather, and earthquakes.

I believe I have discovered another lunar cycle, which I call the "lunar chaos cycle."

My theory is that, as the moon rides high and low and moves closer and further from the earth, it crosses the boundary between the ionized particles trapped in the moon's wake and the fast-flowing solar wind. Figure 2 shows boundary crossings at two full-moon positions (1 and 2) and two new-

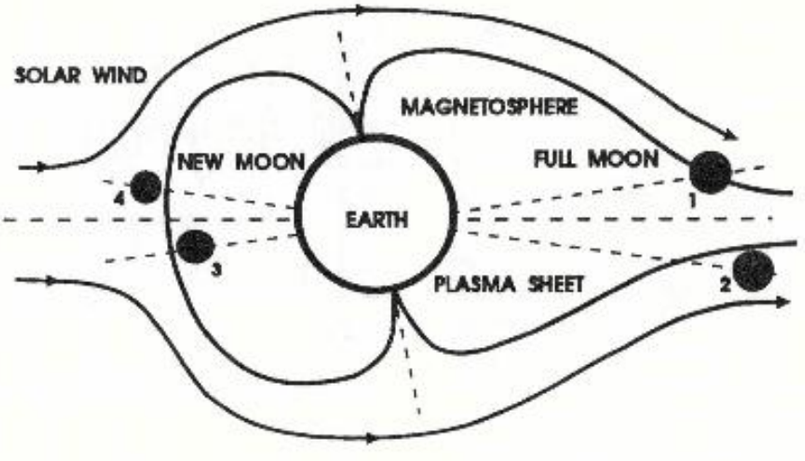


FIG. 2. Lunar chaotic boundaries.

moon positions (3 and 4). Such boundary crossings would lead to sharp disturbances in the earth's magnetic field, which would affect those of us who live within it.

A further perturbation can be theorized, as well—the perturbation of the nearby planets, Mercury and Venus. When the moon is balanced on the edge of the magnetopause, a chaotic balance point exists (Hannula 1990). Either interior planet can tug the moon into the solar wind, tipping the balance just as Lorenz's Butterfly Effect tips the balance in weather patterns (Gleick 1987).

A Simple Mathematical Model

To test this theory, I created a simple mathematical model. This model computes the degree of exact alignment of a planet (either Mercury or Venus) with the Earth and moon, and when the moon is above or below 3° inclination. This yields a lunar chaos input function for each planet. The equations are given below:

a(t) = 10 for |i| > 5 degrees

a(t) = 10 |i| for |i| > 3 and <5 degrees

b(t) = 10 ((30 - |a|)/30) for |a| < 30

b(t) = 0 for |a| > 30 degrees

f(t) = a(t) b(t)

where

a(t) is a lunar inclination function

b(t) is a planetary alignment function

f(t) is a lunar chaos function

|i| is the absolute value of moon's inclination, i

|a| is the absolute value of the planet to moon geocentric angle

These equations give a maximum value when the planet and the moon line up directly, and when the moon is at maximum height above or below the ecliptic. They have zero values inside the theorized envelope boundaries, yielding nonlinear equations.

It is well known that nonlinear equations can lead to systems that exhibit chaotic behavior (Gleick 1987; Hannula 1990).

Statistical Testing

In a test of any such theory, standard research practice is to compare the observed correlations with that which would be expected if the correlations were purely random. The probability of the correlation occurring by chance is computed from the formula below (Shirley 1988):

For A possibly causual events, correlating with B possible resulting events, with K of the B events falling within window W about each A event, over time interval T, the probability of chance occurrence is:

$$P_{TOTAL} = \frac{B!}{K!\,(B-K)!} P^{K} (1-P)^{(B-K)}$$

where

P is the probability of one event falling into time window W and equals AW/T

and n! means (n)(n-1)(n-2)...(2)(1)

The first step in verification of the lunar chaos theory is to examine the relationship with the earth's magnetic field. Figure 3 shows one year of a ten-year study that correlates the two lunar chaos functions with K_pSum, which is the daily sum of K_p planetary geomagnetic field measurements.

The Mercury chaos function correlates 30 times better than chance, and the Venus function correlates 62 times better than chance. Fully 92% of the Venus events mark sharp highs or lows in the electromagnetic field, while 83% of the Mercury events do so.

The second test of the theory was to examine the relationship to human psychology. This was more difficult because of the absence of readily available data on psychological moods. However, I was able to obtain one data set that measures the number of psychological crises at a crisis center over a two-year period. Correlation of the chaos functions with this data is shown in Figure 4.

The Venus lunar chaos function correlated 36 times better than chance, and the Mercury function was 131 times better than chance. Fully 76% of the Venus events coincided with highs and lows in the crises data, as did 84% of the Mercury events.

Another step in the test was to examine the relationship to market movements, which are commonly believed to be caused by the changing psychology of buyers and sellers. One market which seems to validate this theory is gold. Figure 5 shows one year of a ten-year correlation study made between lunar chaos functions and the price of gold. The chaos functions tend to mark highs, lows, and volatile moves in gold. Particularly dramatic are those periods when both Mercury and Venus tug the moon as it passes into the solar wind.

To test the possible randomness of this correlation, I performed a ten-

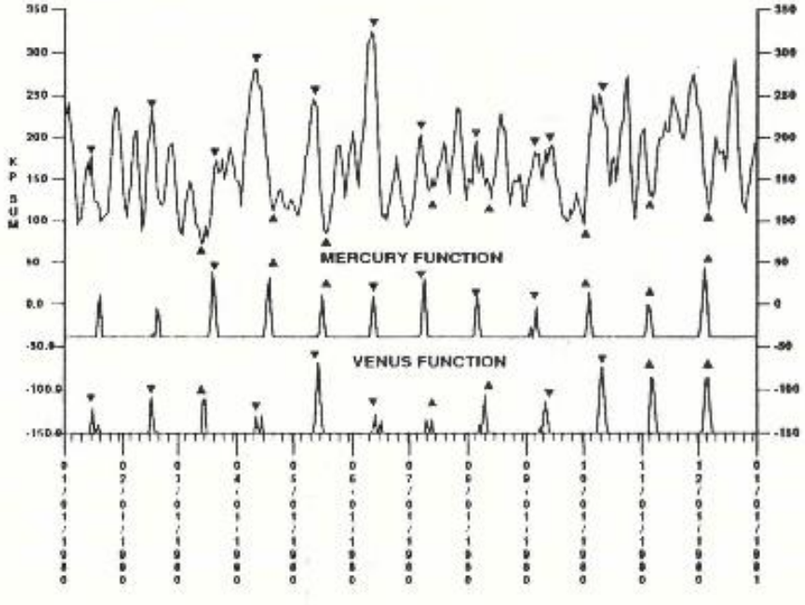


FIG. 3. KpSum Magnetic Index and the lunar chaos functions.

FIG. 4. Psychological crises and lunar chaos functions

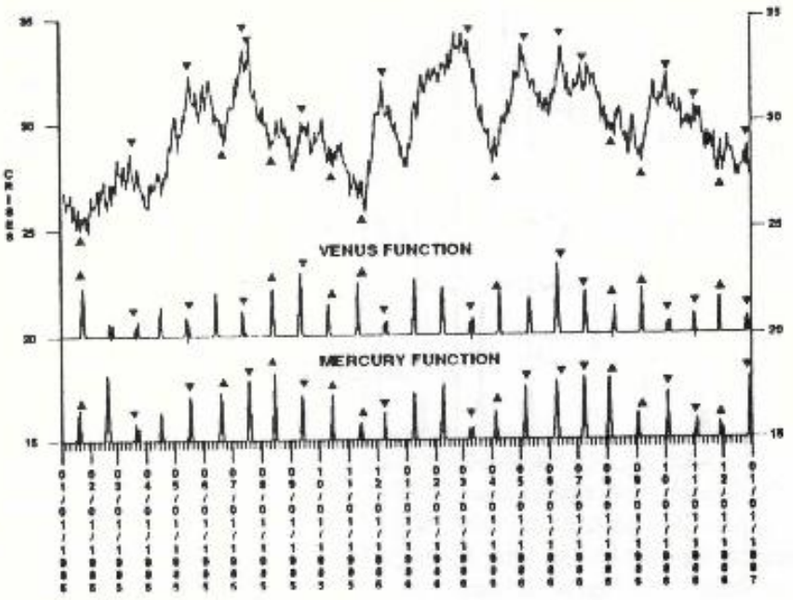


FIG. 5. Gold and the two lunar chaos functions.

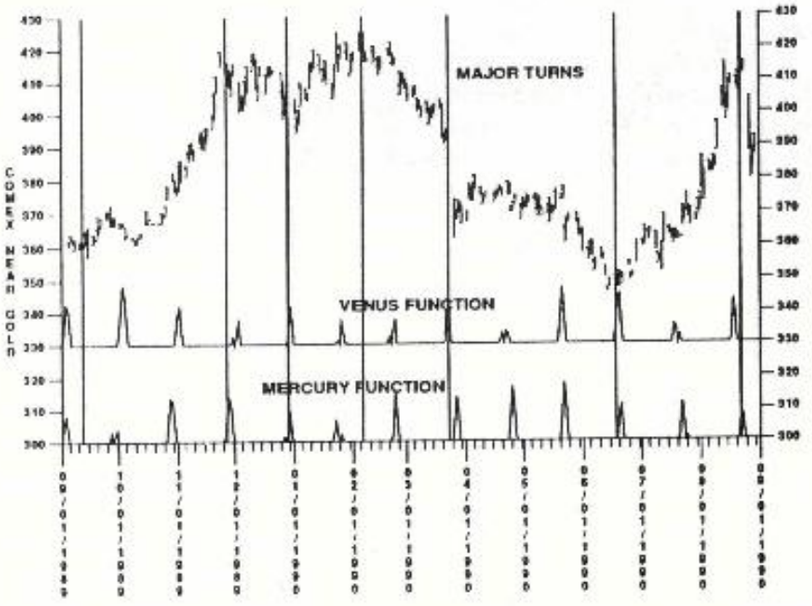
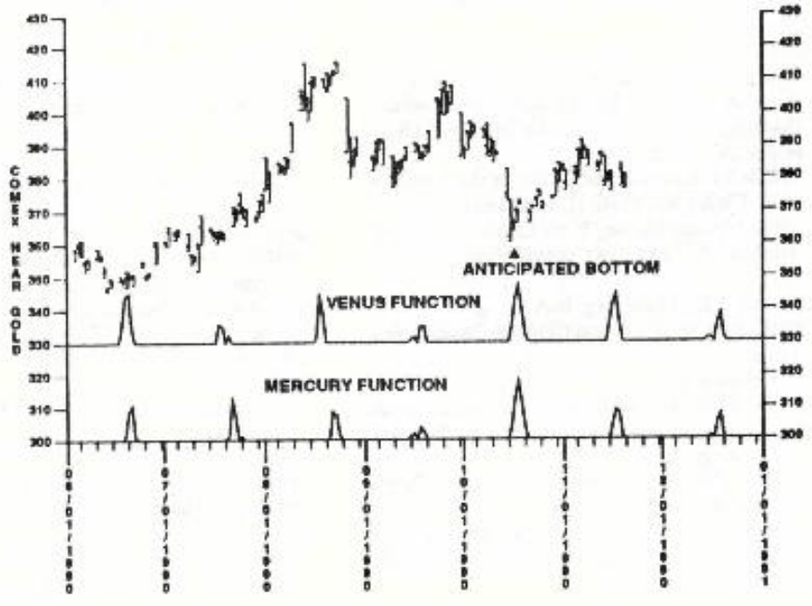


FIG. 6. Using the two lunar chaos functions.



year statistical study. I counted the number of lunar chaos events that coincided with mechanically selected highs and lows in gold. The mechanical selection process used was to take a 5-day moving average of gold near contract closes, then to require at least a 3% countertrend move to indicate a significant high or low.

This process yielded 85 significant highs and lows in the 3,652 days of the test. A window of ten days was used, since the average width of the chaos function "pulse" is about six days, and two days either side of this seemed a reasonable window. Table 1 gives the statistics of the study.

TABLE 1. Gold Chaos Statistics.

	VENUS	MERCURY	BOTH
Number of chaos events	121	121	88
Number of turns hitting windows	41	40	31
Probability of being random	.00138	.00254	.00350
Odds against being random	724:1	393:1	285:1

NOTE:
Number of turns in gold = 85
Window = 10 days
Interval = 3,652 days

This study indicates correlations for the Venus chaos function that is 724 times better than chance; the Mercury chaos function is 393 times better than chance, and both simultaneously are 285 times better than chance. While not positive proof of the theory, these values certainly are statistically significant.

A Real-time Test

On October 1, 1990, gold gapped and closed lower. A few days later a correction had formed, and the question arose, "When will the downtrend end?" Examination of the lunar chaos functions indicated a possible bottom in the period between October 15 and 21, with the October 17 as the most likely date. Additionally, gold could be expected to be volatile into this bottom. Figure 6 shows what actually happened. Gold bottomed on October 16, after a plunge of more than $60. The following rally recovered more than 30 points.

Other Correlations

Such a powerful phenomena also can be expected in other markets. Figure 7 plots the S&P 500 index with the lunar chaos functions. The functions again mark highs and lows. The probability of these correlations being random is less than one chance in 297.

Figure 8 shows the effect of this phenomenon on IBM stock. IBM was rallying steadily following the dramatic summer 1990 Iraq panic. Suddenly, IBM plunged nearly 13 points, and just as suddenly rebounded sharply. This was a new-moon phenomenon, with the moon riding low, and Mercury and Venus both in line with the sun, moon, and Earth. I call this very noticeable signature a "lunar chaos notch."

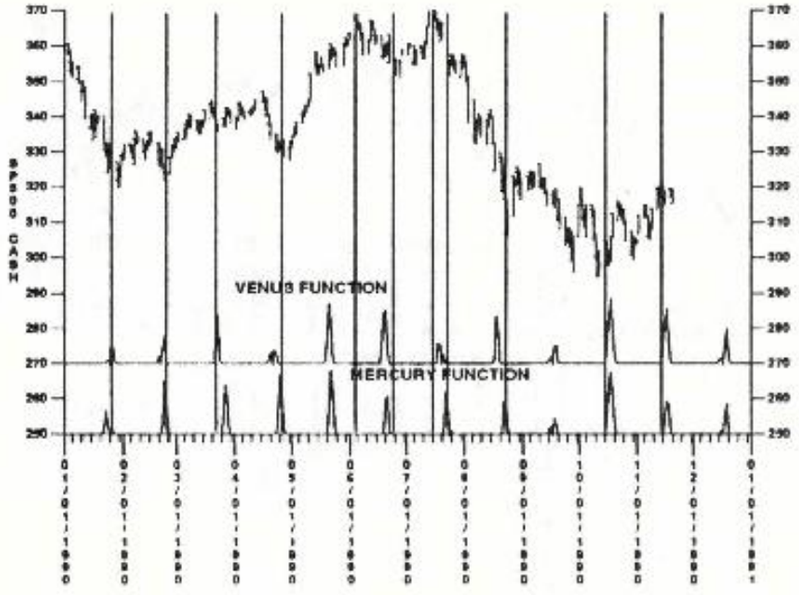


FIG. 7. S&P 500 and the two lunar chaos functions.

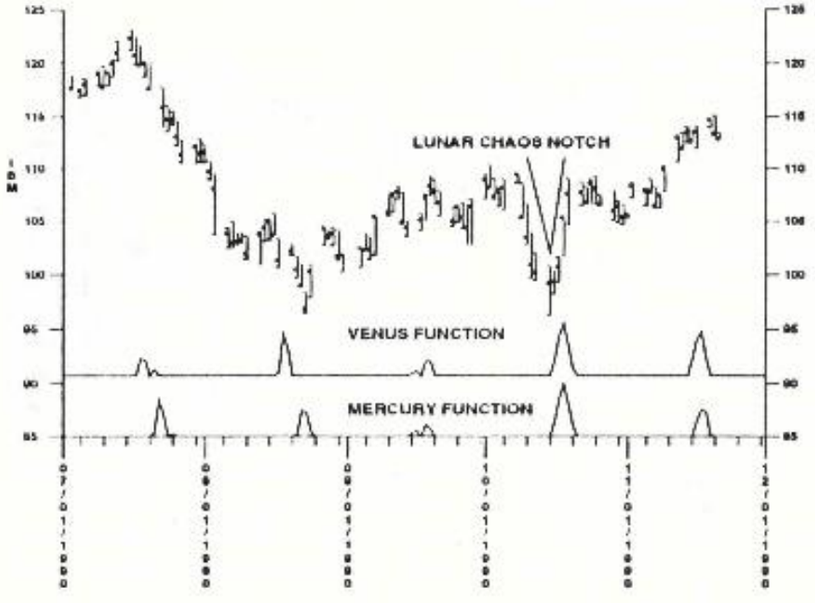


FIG. 8. Lunar chaos signature in IBM.

Conclusions

It may be difficult at first for the average trader of stocks and commodities to accept that his fortunes are controlled by a burning ball of gas and ten pieces of revolving rock, but this study presents scientific evidence that this, indeed, may be true. The theory of lunar chaos provides a rational explanation of possible cause and effect. The statistics of correlation, while they do not "prove" the theory correct, are sufficiently strong to permit one to claim that this theory is possible.

As with any new theory, much needs to be done to improve it. Work currently is underway to procure the NASA lunar seismographic and accelerometer data for further verification of lunar chaos timing and related geomagnetic disturbances. However, even in its current form, this theory and the two chaos functions can provide traders with a valuable timing tool. CYCLES

References

Astronomical Almanac
1990. U.S. Government Printing Office.

Blizard, J.B.
1986-1990. *Lunar Newsletter*. Boulder, Colorado.

Clayton, H.H.
1917. *Effects of Short Period Variations of Solar Radiation on the Earth's Atmosphere.* Smithsonian Institution (May).

Danby, J.M.A.
1962. *Fundamentals of Celestial Mechanics.* Wilman-Bell, Richmond, Virginia.

Gleick, J.
1987. *Chaos: Making A New Science.* Viking, New York.

Hannula, H.
1987a. In Search of the Cause of Cycles. *Technical Analysis of Stocks and Commodities* (March). Reprinted in *Cycles* 38:159-66 (September/October).
1987b. In Search of the Cause of the Crash of 1987. *Cycles* 38:241-43 (December).
1990. Making Money With Chaos. *Technical Analysis of Stocks and Commodities* (September).

Herman, J.R.; Goldberg, R.A.
1985. *Sun, Weather, and Climate.* Dover, New York.

Landscheidt, T.
1988. Multidisciplinary Forecast of Stock Prices. *In* Foundation for the Study of Cycles, *Proceedings*, p. 75-78.
1989a. Creative Functions of Cycles. *Cycles* 40:133-38 (May/June).
1989b. Predictable Cycles in Geomagnetic Activity and Ozone Levels. *Cycles* 40:261-64 (September/October).

Luby, W.A.
1945. The Cause of Sunspots. *Popular Astronomy* (February).

Matlock, C.C.
1977. *Man and Cosmos.* Development Cycles Research Project, Waynesville, North Carolina.

Meeus, J.
1985. *Astronomical Formulae for Calculators.* Wilman-Bell, Richmond, Virginia.

McCormac, B.M., editor
1983. *Weather and Climate Responses to Solar Variations.* Colorado Associated Univ. Press.

Old Farmer's Almanac
1990. Yankee Publishing, Dublin, New Hampshire.

Pugh, B.H.
1928. *Science and Secrets of Wheat Trading.* 6 volumes.

Shirley, J.H.
1988. When the Sun Goes Backward. *Cycles* 39:113-19 (May/June).

Thompson, L.M.
1988. The 18.6-year and 9.3-year Lunar Cycles. *Cycles* 39: 286-91 (December).